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(54) VACUUM TREATING DEVICE AND SEMICONDUCTOR MANUFACTURING LINE USING IT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a vacuum treating device that suppresses an increase in the manufacturing cost while coping with an increase in diameter of a sample and, in addition, is not deteriorated in maintainability.
SOLUTION: This vacuum treating device has one cassette block and a plurality of vacuum treating blocks. The cassette block has a cassette base on which a cassette housing samples is placed and a first sample transport means which transports the samples. Each vacuum treating block has a load-lock chamber, a vacuum treating chamber in which the samples are treated under a vacuum, and a second sample transport means which transports the samples under a vacuum. The cassette base is arranged in the front section of the vacuum treating device and the first sample transport means is commonly used for transporting samples one by one between a plurality of cassettes arranged in the front section of the treating device and the load-lock chamber of each vacuum treating block.

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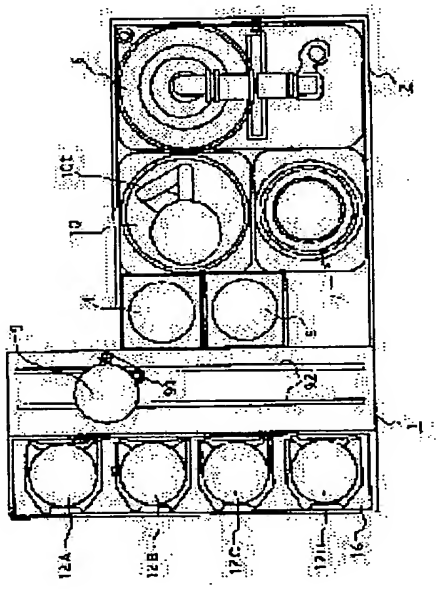

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CLAIMS

[Claim(s)]
[Claim 1] It is the vacuum processor which has one cassette block and two or more vacuum processing blocks. Said one cassette block It has the cassette base in which the cassette which contained the sample is laid, and the first sample conveyance means which conveys said sample. Each of said vacuum processing block It has a load lock chamber, the vacuum processing room which processes said sample under a vacuum, and the second sample conveyance means which conveys said sample under a vacuum. Said cassette base It is arranged at the front section of said vacuum processor. Said first sample conveyance means The vacuum processor characterized by being a common conveyance means for conveying said sample for every sheet between two or more cassettes put in order by said front section and said load lock chamber which each of said vacuum processing block has.
[Claim 2] It is the vacuum processor characterized by carrying out horizontal migration in the direction where said first sample conveyance means has been arranged between said cassette bases and said load locks chamber in a vacuum processor according to claim 1, and said two or more cassettes were put in order.
[Claim 3] It is the vacuum processor characterized by arranging each of said vacuum processing blocks of two or more in the same side face of said one cassette block in a vacuum processor according to claim 1, and being arranged.
[Claim 4] It is the vacuum processor characterized by dividing said load lock chamber into a loading side load lock chamber and an unload side load lock chamber in a vacuum processor according to claim 1, and being constituted.
[Claim 5] One cassette block which has the cassette base in which the cassette which contained the sample is laid, and the first sample conveyance means which conveys said sample, The first load lock chamber and the first vacuum processing room which processes said sample under a vacuum, The first vacuum processing block which has the second sample conveyance means which conveys said sample under a vacuum between said first load lock chamber and said first vacuum processing room, The second load lock chamber and the second vacuum processing room which processes said sample under a vacuum, It is the vacuum processor which has the second vacuum processing block which has the third sample conveyance means which conveys said sample under a vacuum between said second load lock chamber and said second vacuum processing room. Said cassette base is arranged in the front section of said vacuum processor. Said first sample conveyance means The vacuum processor characterized by being a common conveyance means for conveying said sample for every sheet between two or more cassettes put in order by said front section, said first load lock chamber, and said second load lock chamber.
[Claim 6] It is the vacuum processor characterized by carrying out horizontal migration in the direction where said first sample conveyance means has been arranged in a vacuum processor according to claim 5 between said cassette base, said first load lock chamber, and said second load lock chamber, and said two or more cassettes were put in order.
[Claim 7] It is the vacuum processor characterized by arranging said first vacuum processing block and said second vacuum processing block in the same side face of said cassette block in a vacuum processor according to claim 5, and being arranged.
[Claim 8] It is the vacuum processor characterized by dividing respectively said the first load lock chamber and said second load lock chamber into a loading side load lock chamber and an unload side load

lock chamber in a vacuum processor according to claim 5, and being constituted.
[Claim 9] It is the semi-conductor production line with which it has two or more vacuum processors, and a cassette conveyance means to supply or collect the cassettes which contained the sample to said vacuum processor moves into a bay area in the inside of said bay area. Among said two or more vacuum processors, at least one vacuum processor It consists of one cassette block and two or more vacuum processing blocks. Said one cassette block It has the cassette base in which said cassette is laid, and the first sample conveyance means which conveys said sample. Each of said vacuum processing block It has a load lock chamber, the vacuum processing room which processes said sample under a vacuum, and the second sample conveyance means which conveys said sample under a vacuum. Said cassette base It is arranged at the front section of said vacuum processor. Said first sample conveyance means The semi-conductor production line characterized by being a common conveyance means for conveying said sample for every sheet between two or more cassettes put in order by said front section and said load lock chamber which each of said vacuum processing block has.
[Claim 10] It is the semi-conductor production line characterized by carrying out horizontal migration in the direction where said first sample conveyance means of said vacuum processor has been arranged between said cassette bases and said load locks chamber in a semi-conductor production line according to claim 9, and said two or more cassettes were put in order.
[Claim 11] It is the semi-conductor production line characterized by arranging each of said vacuum processing blocks of said vacuum processor of two or more in the same side face of said one cassette block in a semi-conductor production line according to claim 9, and being arranged.
[Claim 12] It is the semi-conductor production line characterized by dividing said load lock chamber of said vacuum processor into a loading side load lock chamber and an unload side load lock chamber in a semi-conductor production line according to claim 9, and being constituted.
[Claim 13] It is the semi-conductor production line with which it has two or more vacuum processors, and a cassette conveyance means to supply or collect the cassettes which contained the sample to said vacuum processor moves into a bay area in the inside of said bay area. Among said two or more vacuum processors, at least one vacuum processor One cassette block which has the cassette base in which said cassette is laid, and the first sample conveyance means which conveys a sample, The first vacuum processing block which has the first load lock chamber, the first vacuum processing room which processes said sample under a vacuum, and the second sample conveyance means which conveys said sample under a vacuum between said first load lock chamber and said first vacuum processing room, and the second load lock chamber, It is the vacuum processor which has the second vacuum processing block which has the second vacuum processing room which processes said sample under a vacuum, and the third sample conveyance means which conveys said sample under a vacuum between said second load lock chamber and said second vacuum processing room. Said cassette base is arranged in the front section of said vacuum processor. Said first sample conveyance means The semi-conductor production line characterized by being a common conveyance means for conveying said sample for every sheet between two or more cassettes put in order by said front section, said first load lock chamber, and said second load lock chamber.
[Claim 14] It is the semi-conductor production line characterized by carrying out horizontal migration in the direction where said first sample conveyance means of said vacuum processor has been arranged in a semi-conductor production line according to claim 13 between said cassette base, said first load lock chamber, and said second load lock chamber, and said two or more cassettes were put in order.
[Claim 15] It is the semi-conductor production line characterized by arranging said first vacuum processing block of said vacuum processor and said second vacuum processing block in the same side face of said cassette block in a semi-conductor production line according to claim 13, and being arranged.

[Claim 16] It is the semi-conductor production line characterized by dividing said the first load lock chamber and said second load lock chamber of said vacuum processor into a loading side load lock chamber and an unload side load lock chamber in a semi-conductor production line according to claim 13, and being constituted.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the semi-conductor production line which manufactures semi-conductor DEBAISU using a suitable vacuum processor and suitable it to start a vacuum processor, especially carry out sheet processing of etching, CVD (chemical vapor growth), sputtering, ashing, RINSA (rinsing), etc. to the sample which are semiconductor device substrates, such as Si.
[0002]
[Description of the Prior Art] When the vacuum processor which processes a sample is divided roughly, it consists of a cassette block and a vacuum processing block, and a cassette block has the front which faces the bay path of a semi-conductor production line, and is extended to a longitudinal direction, and has an atmospheric-air robot with the alignment unit which doubles the cassette for samples, and the orientation of a sample. A loading side load lock chamber, an unload side load lock chamber, the vacuum processing room, the back vacuum processing room, the vacuum pump, the vacuum robot, etc. are formed in the vacuum processing block.
[0003] In these vacuum processors, the sample taken out from the cassette of a cassette block is conveyed by the atmospheric-air robot to the load lock chamber of a vacuum processing block. As for the sample which was further conveyed by the vacuum robot from the load lock chamber at the processing room, and was set on the electrode structure, processing of plasma etching etc. is made. Then, the need is accepted, and it is conveyed and processed at an after-treatment room. A sample [finishing / processing] is conveyed by the cassette of a cassette block with a vacuum robot and an atmospheric-air robot.
[0004] As an example of the vacuum processor which carries out plasma-etching processing of the sample, there are some which were indicated by JP,61-8153,B, JP,63-133532,A, JP,6-30369,B, JP,6-314729,A, JP,6-314730,A, and the U.S. Pat. No. 5,314,509 specification, for example.
[0005]
[Problem(s) to be Solved by the Invention] The vacuum processor of the above-mentioned conventional technique arranges a processing room and a load lock chamber concentrically, or arranges them in the shape of a rectangle. For example, a vacuum robot is stationed near the center of a vacuum processing block, three processing rooms are concentrically arranged to the perimeter, and, as for the equipment indicated by the U.S. Pat. No. 5,314,509 specification, the loading side load lock chamber and the unload side load lock chamber are prepared between the vacuum robot and the cassette block. With these equipments, there is a problem that angle of rotation of the conveyance arm of an atmospheric-air robot or a vacuum robot is large, therefore the need floor space of the whole equipment is large.
[0006] On the other hand, about the processing room within the vacuum processing block of a vacuum processor, or the piping device of vacuum pump and others various kinds, it is required a commuter's ticket and to maintain check repair etc. irregularly. Therefore, the door is prepared in the perimeter of a vacuum processing block, and it has come to be able to perform check repair of a load lock chamber, an unload lock chamber, a processing room, a vacuum robot, and various kinds of piping devices by opening this door generally.
[0007] Although the diameter d of the sample which deals with the conventional vacuum processor was below 8 inches (about 200mm), the dimension Cw of a cassette is also about 250mm, and the magnitude

of a floor space had become the problem that this was also big. Furthermore, if a diameter d considers dealing with the sample of a diameter of macrostomia like 12 inches (about 300mm), the dimension Cw of a cassette will become large with about 350mm, and the width of face of the cassette block which contains two or more cassettes will also become large. When the width of face of a vacuum processing block is determined according to this width of face, the whole vacuum processor will need a big tooth space. When the cassette block which contains four cassettes was considered as an example and the diameter d of a sample becomes 12 inches from 8 inches, the width of face of a cassette cannot but become large about 40cm or more at least.

[0008] On the other hand, in order to perform a lot of processing, performing various kinds of processings in a sample, in the general semi-conductor production line, two or more vacuum processors which perform the same processing are brought together in the same bay, and automatic or a manual is performing conveyance between each bay. Since such a semi-conductor production line needs a high air cleanliness class, the whole semi-conductor production line is installed in a big clean room. Although enlargement of the vacuum processor accompanying diameter[of macrostomia]-izing of a sample is accompanied by enlargement of clean room occupancy area, this makes the installed cost of the high clean room of an installed cost increased further from the first. If a vacuum processor with a big occupancy area is installed in the clean room of the same area, the number of the whole vacuum processor must be reduced, or spacing between each vacuum processor must be narrowed. The number reduction of installation of the vacuum processor in the clean room of the same area is inevitably accompanied by the rise of low Shimo of the productivity of the production line of a semi-conductor, as a result the manufacturing cost of a semi-conductor. On the other hand, narrowing spacing between each vacuum processor runs short of the maintenance tooth spaces for check repair, and it checks the maintenance nature of a vacuum processor remarkably.

[0009] The purpose of this invention is to offer the vacuum processor which can suppress the rise of a manufacturing cost, corresponding to diameter-ization of macrostomia of a sample.

[0010] Other purposes of this invention are to offer the vacuum processor excellent in maintenance nature, corresponding to diameter-ization of macrostomia of a sample.

[0011] Other purposes of this invention are to offer the semi-conductor production line which secures the need installation number of a vacuum processor, and suppresses the rise of a manufacturing cost, and does not spoil maintenance nature, either, corresponding to diameter-ization of macrostomia of a sample.

[0012]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention consists of a cassette block and a vacuum processing block. For this cassette block The cassette base in which the cassette which contained the sample is laid is prepared. For said vacuum processing block In the vacuum processor with which the processing room which carries out vacuum processing of said sample, and a vacuum conveyance means to convey said sample have been arranged When the flat-surface configurations of said cassette block and said vacuum processing block are abbreviation rectangles, respectively and set [the width of face of said cassette block] width of face of W2 and said cassette to Cw for the width of face of W1 and said vacuum processing block, it is W1-W2 >=Cw. It is characterized by carrying out. A twist also enlarges the width method of said vacuum processing block for the width method of said cassette block, and other descriptions of this invention are to have formed the flat-surface configuration of said vacuum processor in L typeface or T typeface.

[0013] Other descriptions of this invention are semi-conductor production lines with which two or more bay areas which incorporated two or more vacuum processors which consist of a cassette block and a vacuum processing block, respectively have been arranged in order of the production process of a semi-conductor. The cassette base which lays the cassette which contained the sample in said cassette block is prepared. For said vacuum processing block In that by which the processing room which carries out vacuum processing of said sample, and a vacuum conveyance means to convey said sample have been arranged at least one of said the vacuum processors When two or more said cassette blocks are constituted possible [receipt] in the sample which has the diameter of 300mm or more and set [the width of face of this cassette block] width of face of W2 and said cassette to Cw for the width of face of W1 and said vacuum processing block, it is W1-W2 >=Cw. It is in the semi-conductor production line carried out.

[0014] The cassette block whose descriptions of other of this invention contain the sample which has the

diameter of 300mm or more, It is the Rhine configuration approach of semiconductor fabrication machines and equipment equipped with two or more vacuum processors which consist of a vacuum processing block which performs vacuum processing to said sample. At least one of said the vacuum processors The width method of said cassette block is larger than the width method of said vacuum processing block. The flat-surface configuration of said vacuum processor is formed in L typeface or T typeface, and is in the Rhine configuration approach of having secured the maintenance tooth space between the vacuum processors contiguous to said L typeface or T typeface vacuum processor.
[0015]
[Function] According to this invention, the flat-surface configurations of a cassette block and a vacuum processing block are abbreviation rectangles, respectively, and it is the width of face of said cassette block W1 It carries out and is the width of face of said vacuum processing block W2 When it carries out, W1 > W2 When the flat-surface configuration of the whole vacuum processor changes with a configuration like L form or T form and it arranges many such vacuum processors by constituting so that it may become relation, even if it narrows spacing of an adjoining vacuum processor between [adjoining] vacuum processing blocks — **** — sufficient tooth space is secured. For example, a 0.7m maintenance tooth space can be secured between adjoining vacuum processors, being able to use W2 as 0.8m being able to use W1 as 1.5m.
[0016] In spite of diameter[of macrostomia]-izing of a sample, the installation number of the vacuum processor in the clean room of the same area is not decreased compared with the former, and, therefore, the fall of the productivity of the production line of a semi-conductor is not caused. Therefore, corresponding to diameter-ization of macrostomia of a sample, the rise of a manufacturing cost can be suppressed and the vacuum processor which was moreover excellent in maintenance nature can be offered.
[0017] Moreover, the semi-conductor production line which secures the need installation number of a vacuum processor, and suppresses the rise of a manufacturing cost, and does not spoil maintenance nature, either can be offered, corresponding to diameter-ization of macrostomia of a sample by building the vacuum processor of this invention into a semi-conductor production line.
[0018]
[Example] Hereafter, drawing 1 thru/or drawing 4 explain the configuration of the vacuum processor which becomes one example of this invention. The vacuum processor 100 consists of rectangular parallelepiped-like the cassette blocks 1 of a configuration and the vacuum processing blocks 2, respectively, as shown in drawing 1 . The flat-surface configurations of the cassette block 1 and a vacuum processing block are rectangles, respectively, and the flat-surface configuration serves as L typeface as a whole. The cassette block 1 faced the bay path of a semi-conductor production line, and is extended to the longitudinal direction so that it may mention later, and the cassette base 16 and control panel 14 which deliver and receive the cassette 12 which contained the sample between bay paths are prepared in the front-side. The vacuum processing block 2 installed in the tooth back of the cassette block 1 is extended in the direction of a right angle to the cassette block 1, and builds in equipment and the transport device which perform various kinds of vacuum processings.
[0019] As shown in drawing 2 - drawing 4 , there are the atmospheric-air robot 9 for sample conveyance and a cassette 12 for sample maintenance in the cassette block 1. The cassette 12 for samples consists of cassettes 12A, 12B, and 12C for product samples, and cassette 12D for dummy samples. A cassette 12 may be adjoined if needed and you may prepare orientation doubling a sample. The sample for products or the sample for a product and dummies is altogether contained by the cassette 12 for samples. The sample the object for a foreign matter check and for cleaning is contained by the maximum upper case and the bottom of a cassette.
[0020] Moreover, the loading side load lock chamber 4, the unload side load lock chamber 5, the vacuum processing room 6, the back vacuum processing room 7, the vacuum pump 8, and the vacuum robot 10 are formed in the vacuum processing block 2. The discharge means for etching in 13 and 14 are the discharge means for after treatment (ashing).
[0021] The atmospheric-air robot 9 is formed in the cassette block 1 possible [transit on the rail 92 installed in parallel with the cassette base 16], and conveys a sample 3 between the loading side load lock chamber 4 of a cassette 12 and the vacuum processing block 2, and the unload side load lock chamber 5. The vacuum robot 10 conveys a sample 3 between the vacuum processing room 6, the unload

side load lock chamber 5, and the back vacuum processing room 7 while conveying a sample 3 from the loading side load lock chamber 4 to the vacuum processing room 6. This invention is premised on a diameter d dealing with the sample of the diameter of macrostomia more than 12 inch (about 300mm). If it is a 12 inches sample, the dimension Cw of a cassette will be set to about 350mm - about 360mm.
[0022] The vacuum processing room 6 is ** which processes one sample 3 at a time, for example, carries out plasma-etching processing, and is established in the upper left section of the vacuum processing block 2. The loading side load lock chamber 4 and the unload side load lock chamber 5 are established in a part for the lower edge part of the opposite side 2 of the vacuum processing room 6, i.e., a vacuum processing block, on both sides of the vacuum robot 10, respectively. The back vacuum processing room 7 is ** which carries out after treatment of every one sample [finishing / processing] 3, and is established in the interstitial segment of the vacuum processing block 2 corresponding to the unload side load lock chamber 5.
[0023] The atmospheric-air robot 9 has the slide arm 91, and the locus of the slide arm expanded and contracted, moving in a rail 92 top is constituted so that it may become the locus which includes the unload side load lock chamber 5 in the cassette 12 list of a loader at loading side load-lock-chamber 4 list. As the vacuum robot 10 has a slide arm 101 and becomes the locus to which the revolution locus of this slide arm includes the vacuum processing room 6 in loading side load-lock-chamber 4 list, he is formed in the vacuum processing block 2. Therefore, as a vacuum robot's slide arm 101 becomes the locus to which a revolution locus includes the back vacuum processing room 7 in the vacuum processing room 6 and unload side load-lock-chamber 5 list, it is prepared in it. In addition, the right-hand side part on the cassette block 1 is sufficient as the atmospheric-air robot's 9 location.
[0024] Moreover, the wafer search device is prepared in the perimeter of each cassette 12, and when a cassette 12 is set, a wafer search device recognizes the sample in each cassette. Furthermore, the sample push raising devices 14A and 14B are formed in each load locks chamber 4 and 5, the vacuum processing room 6, and the back vacuum processing room 7, respectively, and it has the composition that a sample 3 can be delivered to each robot's slide arm 91,101, respectively. Furthermore, the electrode of the discharge means 13 for etching and sample installation base 14C are prepared in the vacuum processing room 6. Sample push raising device 14B is prepared in the interior of the discharge means 13 for etching. 15 is a ring-like gate valve.
[0025] Next, plasma-etching processing is made into an example and processing actuation of the sample in the vacuum processor 100 is explained briefly. First, by moving the atmospheric-air robot 9 of the cassette block 1 on a rail 92, for example, bringing close to loading side cassette 12A, and lengthening the slide arm 91 toward this cassette 12A side further, a fork (not shown) is inserted under the sample 3 in a loading side cassette, and a sample 3 is transferred on a fork. And where the lid of the loading side load lock chamber 4 is opened, the atmospheric-air robot's 9 arm 91 is moved to the loading side load lock chamber 4, and a sample 3 is conveyed. The atmospheric-air robot 9 is moved on a rail 92 if needed, and it is made for the stroke of a slide arm 91 to reach the loading side load lock chamber 4 at this time.
[0026] Then, sample push raising device 14A is operated, and a sample 3 is supported on the supporter material of the loading side load lock chamber 4. Furthermore, after carrying out evacuation of the loading side load lock chamber 4, supporter material is descended, sample push raising device 14A is operated again, a sample 3 is delivered to the vacuum robot's 10 arm 101, and the inside of the conveyance path within the vacuum processing block 2, i.e., a vacuum, is conveyed to the vacuum processing room 6. Moreover, a sample 3 is conveyed to the unload side cassette location of the cassette block 1 by this reverse actuation.
[0027] In addition, when after treatment is required, it conveys via the back vacuum processing room 7 by the vacuum robot's 10 arm 101. At the back vacuum processing room 7, plasma after treatment, such as ashing, is carried out to the sample [finishing / etching processing] 3.
[0028] In drawing 3 , the locus of the vacuum robot's 10 arm 101 has a sample 3 in the loading side load lock chamber 4, the vacuum processing room 6, and the back vacuum processing room 7, and considering the condition that there is no wafer in the unload lock chamber 5, it is as follows. That is, first, the vacuum robot's 10 arm 101 moves the sample 3 of one sheet of the back vacuum processing room 7 to the unload lock chamber 5, and moves the sample 3 of the vacuum processing room 6 to the back vacuum processing room 7. Next, the sample 3 of the loading side load lock chamber 4 is conveyed in the vacuum processing room 6. Furthermore, the sample 3 of the vacuum processing room 6 is conveyed in

the back vacuum processing room 7. An arm 101 repeats the same locus as the following.
[0029] Moreover, since the vacuum robot 10 is stationed near the side edge of the vacuum processing block 2, even if an operator does not take an impossible posture, he can do check repair of the vacuum robot 10, and it becomes easy to maintain him.
[0030] Drawing 5 is the top view showing an example of the bay area 200 of the semi-conductor production line incorporating the vacuum processor 100 of this invention. In drawing, the vacuum processor 100 of L typeface separates the maintenance tooth space 203 of a gap G1, a large number arrangement is carried out, and room 201A of a high air cleanliness class and room 201B of a low air cleanliness class are divided with the partition 120. The automatic transferring machine (henceforth, AGV) 202 for carrying out supply conveyance of the sample 3 is formed along the front face of the cassette block 1 arranged at room 201A of a high air cleanliness class. It is the maintenance tooth space which much vacuum processing blocks 2 are arranged at room 201B of a low air cleanliness class, and those spacing mentions later on the other hand.
[0031] Drawing 6 is drawing in the semi-conductor production line which becomes the example of this invention showing a part of flow of a sample 3. Test equipment 206 and the bay stocker 208 are formed in the entry section of each bay area 200. The regions of back of each bay area 200 are open for free passage to the maintenance path 210, and the air shower 212 is formed in the entry of the maintenance path 210. The sample 3 supplied to the bay stocker 208 from the exterior is passed one by one by Rhine AGV 204 in [of the predetermined bay area 200 / AGV / 202] a bay according to down stream processing, as an arrow head shows. Furthermore, the cassette block 1 of the vacuum processor 100 is passed from the inside AGV 202 of a bay. A sample 3 has between the cassette block 1 and the vacuum processing blocks 2 conveyed by the atmospheric-air robot 9 and the vacuum robot 10 within the vacuum processor 100. The sample 3 processed with the vacuum processing block 2 is passed in [AGV / 202] a bay, further, is passed to Rhine AGV 204 and conveyed in the next bay area 200.
[0032] In the semi-conductor production line which has the inside AGV 202 of a bay, the inside AGV 202 of a bay supplies a new sample (front [processing] wafer) to the cassette block 1 of each vacuum processor 100 from the bay stocker 208 prepared every bay 200, or collects the cassettes which contained the processed sample from this cassette block 1.
[0033] Corresponding to the demand signal taken out from each vacuum processor 100, from the bay stocker 208 prepared in each bay 200, the inside AGV 202 of a bay runs the cassette which contained the new sample (front [processing] wafer) to the cassette position from which the demand signal was taken out from the cassette block 1 of reception and the vacuum processor 100, and stops.
[0034] Next, that in which the cassette handling robot incorporated in [AGV / 202] the bay has 3 five-axis-control functions of revolution actuation (theta shaft), vertical migration (Z-axis), and grip actuation (phi shaft), a thing with 4 five-axis-control functions of revolution actuation (theta shaft), vertical migration (Z-axis), grip actuation (phi shaft), and order migration (Y-axis), etc. are used.
[0035] A cassette handling robot supplies the new cassette 12 conveyed from the bay stocker 208 to the location which collected these cassettes 12 from the cassette block 1 on the empty cassette place on the inside AGV 202 of a bay first according to the contents of a demand taken out from each vacuum processor 100 when the cassette [finishing / processing / already] 12 was in the specified location of that cassette block 1, next were collected, and became empty.
[0036] If this actuation is completed, even the bay stocker 208 conveys the collected cassette 12, and actuation will be suspended and it will stand by until the following demand signal is taken out from the vacuum processor 100 in a bay 200.
[0037] Although it corresponds to the order which received the signal temporarily when a demand signal is taken out from two or more vacuum processor 100,100 — in a bay 200 between short time, whether the physical relationship of a receiving time lag and a sender is considered, and it deals with order with high conveyance effectiveness from the position in readiness in [AGV / 202] a bay shall depend on the method of construction of a system.
[0038] moreover — as the information on the cassette to deliver — a case — a signal — having received — order — corresponding — although — a receiving time lag and a sender — whether physical relationship is considered and it deals with order with high conveyance effectiveness from the position in readiness in [AGV / 202] a bay shall depend on the method of construction of a system
[0039] Moreover, as information on the cassette to deliver, including the number peculiar to each

cassette and the various information that it is used by management of the whole production line, it is delivered the vacuum processor 100 by an optical transmission system etc. between the inside AGV 202 of a bay, and it is considered that a cassette is managed.
[0040] About the processing in a bay area 200 flowing, explanation is further added paying attention to the sample in each cassette.
[0041] Cassettes 11 and 12 are put side by side by the atmospheric-air block 1 in the 3-4 same horizontal planes. In each cassette, the 300mm (12″) semiconductor device substrate (wafer) is contained for the diameter the number of predetermined leaves every in a sample and this case, respectively.
[0042] In 2-3 cassettes 12, the sample (front [processing] wafer) to which vacuum processing predetermined in the vacuum processing section will be performed from now on is contained among 3-4 KASSETO. The dummy wafer is contained by 11 in [of remaining one piece] a cassette.
[0043] A dummy wafer is used at the time of the cleaning treatment of the check of the number of foreign matters in the vacuum processing section 2, and the vacuum processing chamber which constitutes a vacuum processing field etc.
[0044] Here, suppose that the cassette 12 by which the sample before processing is contained is referred to as 12A, 12B, and 12C. It is in this condition, for example, the sample receipt condition of cassette 12A is checked by the wafer check means (illustration abbreviation). In this case, cassette 12A has the function which contains a sample in every sheet and its height direction.
[0045] As a wafer check means, it has the sensor which detects the existence of a sample in contact or non-contact. And it has the means to which this sensor is moved corresponding to the stowed position of a sample. Moreover, the sample is equipped also with a means to output the signal of whether to be contained by the how many steps of cassette 12A.
[0046] What has the means to which a sensor is moved as a wafer check means so that it may correspond to the sample receipt stage of cassette 12A serially, and the thing in which two or more sensors were formed respectively corresponding to the sample receipt stage of cassette 12A are used. In this case, the means to which a sensor is moved so that it may correspond to the sample receipt stage of cassette 12A serially is unnecessary. Moreover, the sensor of a wafer check means is fixed, instead you may make it move cassette 12A.
[0047] By the wafer check means, it is confirmed whether the sample before processing is contained by which location of the height direction of cassette 12A. For example, as it corresponds to the sample receipt stage of cassette 12A serially, when a wafer check means is what has the means to which a sensor is moved, moving caudad from the upper part from for example, a lower location of cassette 12A, or an up location, the existence of the sample before processing in the sample receipt stage and this receipt stage of cassette 12A is detected, and a sensor goes.
[0048] This check result is inputted into the host computer (illustration abbreviation) for [which is outputted from a wafer check means, for example, manages the whole vacuum processor] semi-conductor manufacture LC, and is memorized. Or you may input into the host computer for device control again through the personal computer in the console box on a base, or this personal computer every cassette.
[0049] Then, the atmospheric-air carrier robot 9 starts actuation in this case. The sample before processing in cassette 12A is taken out out of one sheet and cassette 12A by this atmospheric-air carrier robot's actuation.
[0050] For example, the atmospheric-air carrier robot 9 saved, held and saved the opposite side (rear face) with the processed side of a sample, and has the section. It saves and what adsorbs the rear face of a sample and holds it as the section, the thing which has a slot for maintenance of a sample and the depression section, the thing which grasps this periphery of a sample mechanically are used. Furthermore, what has vacuum adsorption and an electrostatic adsorption function is used as what adsorbs the rear face of a sample and holds it.
[0051] For example, in what saves and holds a sample with a diameter of 300mm (12″) using what adsorbs the rear face of a sample and holds it, it is important to select arrangement of the adsorption section which can make bending of a sample small as much as possible, and a dimension. For example, when the width of face in a cassette etc. is taken into consideration and the diameter of a sample is set to d, spacing of the adsorption section makes the core of a sample a center, and sets it as d / 3 - d/2.
[0052] It saves depending on the amount [of a sample] of bending, and bending direction, and produces

un-arranging [that a gap sometimes arises by carrying out sample delivery at a sample, and the orientation shifts] between the section and other means.
[0053] Moreover, to use what adsorbs the rear face of a sample and holds it, the adsorption power which is extent from which a sample is not desorbed with the inertial force which acts on a sample is required at the time of migration (migration initiation and a halt are included). When not satisfying this, it produces un-arranging [that a sample saves, and drop out of the section or the orientation of a sample shifts at the time of migration].
[0054] This ******** is inserted in the location corresponding to the rear face of the sample before processing which has the need of taking out, within cassette 12A. where it saved and the section is inserted, cassette 12A drops only the specified quantity — having — ** — or it saves and only the specified quantity is raised in the section. It saves, and by the rise of the section, the sample before processing is in descent of this cassette 12A, or the condition of having saved and having been saved into the section, is saved, and is passed to the section. In this condition, it saves and the section is pulled out out of cassette 12A. Thereby, the sample before processing in cassette 12A is taken out out of one sheet and cassette 12A.
[0055] As mentioned above, it is directed by the host computer the sample before which processing in cassette 12A is taken out, and it is controlled by the atmospheric-air carrier robot 9.
[0056] It is serially memorized by the host computer for every sample ejection whether the sample before processing is what was taken out from the how many steps in cassette 12A.
[0057] The atmospheric-air carrier robot 9 which saves and has one sample before processing in the section is moved to the location which can carry in this sample in a load lock chamber 4, and stops.
[0058] The inside of a load lock chamber 4 is intercepted with the vacuum ambient atmosphere of the vacuum processing section 2, and is in an ambient condition. In the load lock chamber 4 of this condition, the sample before processing which the atmospheric-air carrier robot 9 saved and was held at the section is carried in, and it saves, and is passed in a load lock chamber 4 from the section.
[0059] The atmospheric-air carrier robot 9 which handed the sample before processing in the load lock chamber 4 is evacuated to a position in preparation for the next actuation.
[0060] The above actuation is directed by the host computer and controlled.
[0061] It is serially memorized by the host computer whether the sample before processing passed in the load lock chamber 4 is what was taken out from the how many steps in cassette 12A.
[0062] The inside of the load lock chamber 4 which received the sample before processing is intercepted from atmospheric air, and evacuation is carried out. Then, cutoff with the vacuum processing section is canceled and it is made to open the sample before processing for free passage possible [conveyance].
[0063] This sample is conveyed by the vacuum robot 10 from a load lock chamber 4 to the vacuum processing field of the vacuum processing section 2, and predetermined vacuum processing is performed in this vacuum processing field. The sample (processed sample) which vacuum processing ended is conveyed by the unload lock chamber 5 from a vacuum processing field with the vacuum robot 101, and is carried in to this interior of a room.
[0064] Here, the vacuum carrier robot has the pile section made as [be / he / the atmospheric-air carrier robot 9]. And except for what saves and has a vacuum adsorption function as the section, what is used with an atmospheric-air carrier robot, and the same thing are used.
[0065] After carrying in of a processed sample and the inside of the unload lock chamber 5 are intercepted with the vacuum processing section 2, and internal pressure is adjusted to atmospheric pressure.
[0066] Atmospheric-air disconnection of the inside of the unload lock chamber 5 from which internal pressure turned into atmospheric pressure is carried out. In the unload lock chamber 5, the atmospheric-air carrier robot 9 saves, and the section is inserted, and it saves in this condition, and a processed sample is passed to the section.
[0067] A processed sample is received and saved and unload lock 5 outdoor HE taking out of the section is carried out. Then, in preparation for carrying in of the following processed sample, evacuation of the inside of the unload lock chamber 5 is intercepted and carried out from atmospheric air.
[0068] The atmospheric-air carrier robot 9 which saves and has a processed sample in the section on the other hand is moved into cassette 12A by the location which can return this processed sample, and stops.

[0069] Then, a processed sample is had and saved, and the section is in this condition and is inserted into cassette 12A. Here, this insertion point is controlled by the host computer so that a processed sample is originally returned to the contained location.
[0070] it has a processed sample — saving — after [the completion of insertion of the section], and cassette 12A — a rise — or it saves and the section is dropped.
[0071] Thereby, this sample is originally returned to the contained location, and a processed sample is again contained by cassette 12A.
[0072] Such actuation is similarly carried out to the sample before processing in the remaining front [processing] samples in cassette 12A and cassette 12B, and 12C.
[0073] That is, for example, numbering of the sample before processing taken out from each cassette one by one the whole sheet is carried out. For example, it is memorized a sample of what position the sample before processing taken out from the how many steps of which cassette in the host computer is.
[0074] A motion of the sample returned to a cassette after the completion of vacuum processing by being taken out from a cassette for this storage information, and carrying out vacuum processing is managed and controlled.
[0075] That is, by the time a sample is taken out from a cassette and returned to the original cassette, it will accomplish a motion in the following sequence.
[0076] (1) A stowed position check within a cassette (2) Ejection of the sample in the cassette by the atmospheric-air carrier robot (3) Carrying in into the load lock chamber by the atmospheric-air carrier robot (4) Taking out from the unload lock chamber by the conveyance (7) atmospheric-air carrier robot from the vacuum processing field by the vacuum processing (6) vacuum robot in the conveyance (5) vacuum processing field from the load lock chamber by the vacuum robot to a vacuum processing field to an unload lock chamber (8) — the receipt to the original location in the cassette by the atmospheric-air carrier robot — the data of a host computer are updated [the sample of what No. whenever (1) -> (8) and a sample move as mentioned above, is in each station, and] serially. This update process is per carried out the one whole sample. It is managed in which station each sample, i.e., the sample of what No., is by this.
[0077] For example, you may make it display serially the renewal condition processing of serial of the data of a host computer on the CRT screen for vacuum processing system controls. In this case, it is displayed that an operator can check by looking at a glance a sample [each station on a CRT screen, current, and] of what position there are.
[0078] In addition, in what orientation adjustment of the sample before processing accomplishes, this step is carried out between above (2) and (3).
[0079] Such management and control of a motion of a sample are carried out also when the vacuum processing section 2 has two or more vacuum processing fields.
[0080] For example, the vacuum processing section 2 shall have two vacuum processing fields. In this case, series processing is carried out by that processing information, or parallel processing of the sample is carried out. Here, a sample says that vacuum processing of the sample by which vacuum processing was carried out in one vacuum processing field, and this vacuum processing was carried out is succeedingly carried out in the remaining vacuum processing fields, and, as for series processing, parallel processing means that vacuum processing of the sample is carried out in one vacuum processing field, and vacuum processing of other samples is carried out in the remaining vacuum processing fields.
[0081] For example, in series processing, the sample by which numbering was carried out by the host computer is processed according to the sequence, and is returned to the original location in a cassette.
[0082] Moreover, since it is managed and controlled by the host computer in the case of parallel processing in which vacuum processing field the sample by which numbering was carried out was processed how, a sample [finishing / each processing] is returned to the original location in a cassette also in this case.
[0083] In addition, it is taken out from the how many steps in a cassette, and you may make it manage and control by the host computer what position which vacuum processing field is used by that sample in the case of parallel processing.
[0084] Furthermore, since it is managed and controlled by the host computer in which vacuum processing field the sample by which numbering was carried out was processed how also when series processing and parallel processing are intermingled, a sample [finishing / each processing] is returned to the original

location in a cassette also in this case.
[0085] In addition, the combination of the same [for example, a plasma generating method] or the combination of a different plasma etching field, a plasma etching field, and after-treatment fields, such as ashing, the combination of an etching field and a membrane formation field, etc. are mentioned as two or more vacuum processing fields.
[0086] Moreover, if the point that, for example, vacuum processing which is performed to this dummy sample for example, to the sample before processing is not performed is removed also to the dummy sample in the cassette of a dummy sample, it will carry out similarly.
[0087] On the other hand, a cassette and an atmospheric-air carrier robot save, the section, an orientation aligner station, the station in a load lock chamber, and a vacuum carrier robot save, and the detection means of sample existence is formed in the station of the section and a vacuum processing field, and the unload lock indoor station, respectively.
[0088] As a sample detection means, a contact or non-contact-type sensor is chosen suitably, and is used.
[0089] the above-mentioned cassette — it saves and the section and each station serve as a check point in the migration process of a sample.
[0090] In such a configuration, when the vacuum carrier robot 10 saves, those with a sample in the section are detected and a sample is not detected at the station of a vacuum processing field, it means that the vacuum carrier robot 10 or a vacuum carrier robot saves, sample delivery is carried out between the section and the station of a vacuum processing field, and the machine had broken down by a certain cause, and the restoration is carried out in accuracy and a short time. For this reason, the fall of the throughput as the whole equipment can be controlled.
[0091] Moreover, with for example, the configuration in which each carrier robot 9 saves into and the sample detection means is not formed in the section For example, those of the sample in the station in a load lock chamber with a sample are detected. When the sample in the station of a vacuum processing field is not detected, the station in a load lock chamber and a vacuum carrier robot save, and sample delivery is carried out between the sections. A device, Or it means that a vacuum carrier robot or a vacuum carrier robot saves, sample delivery is carried out between the section and the station of a vacuum processing field, and the device had broken down by a certain cause, and the restoration is carried out in accuracy and a short time. For this reason, the fall of the throughput as the whole equipment can be controlled.
[0092] In such an example, it has the following usefulness.
[0093] (1) It confirms whether the sample before processing is contained by the how many steps in a cassette, and since numbering of the this checked sample before processing is carried out and the motion is managed and controlled serially, a processed sample can be certainly returned to the original location in a cassette.
[0094] (2) It confirms whether using the processing information, even if it is series processing, parallel processing, and these cases where mixture processing is carried out, the sample before these processings is contained by the how many steps in a cassette, and since the sample before processing carries out numbering of the this checked sample and is managing and controlling the motion serially, it can return the processed sample in various processings to the original location in each cassette certainly.
[0095] (3) It confirms whether the sample before processing is contained by the how many steps in a cassette, and since numbering of the this checked sample before processing is carried out and the motion is managed and controlled serially, the processing state of the sample processed the whole sheet in the vacuum processing section can be checked and managed exactly finely.
[0096] For example, since the sample which became a defect since it was managed when a certain defect arose in processing of a sample, the processing states, i.e., the processing conditions etc., for every one sample etc., can grasp the processing state depending on whether it is what was contained by the how many steps of which cassette, it can grasp the defect generating cause in a short time, and can shorten that much the time amount which a cure takes.
[0097] In addition, in the above example, although the diameter of a sample is explained as 300mm (12″), especially the above-mentioned usefulness is limited to the diameter of a sample, and cannot do so.
[0098] Next, a maintenance is described. Since the cassette block 1 faces Rhine in [AGV / 202] a bay when maintaining the vacuum processor 100 of this invention, the maintenance of the cassette block 1

can perform the most from a front face.
[0099] On the other hand, in order to maintain the vacuum processing block 2, an operator needs to enter through the maintenance path 210 through the maintenance path 203 to [from behind each bay area 200] a field with the vacuum processing block 2.
[0100] When drawing 7 shows the relation of the magnitude of the vacuum processing block 2 and the cassette block 1, the long side (width of face) of the cassette block 1 was set to W1, it set the shorter side to B1, the shorter side (width of face) of the vacuum processing block 2 is made to W2 and a long side (depth) is made into B-2, W1> It is B1 and W2<B-2, and when the diameter of a sample 3 is set to d, it is good desirably to have the relation W1-W2**d.
[0101] Moreover, it is the gap between vacuum processing blocks which sets to G1 the gap between cassette blocks where the vacuum processor 100 adjoins, and adjoins G2 It is G1<G2 when it carries out (refer to drawing 5). It carries out. And (W1+G1)-W2=MS gives the maintenance tooth space between the adjoining vacuum processors 100. MS is magnitude required in order that an operator may perform a maintenance. In this case, it is good desirably to have the relation (W1+G1)-W2**d. Although the maintenance tooth space 203 serves as an operator's entrance, this tooth space may not be provided depending on the layout of a bay area 200. Even in such a case, although G1 is the need at worst whenever [between vacuum processor 100 / installation allowances / to adjoin], it becomes a value near zero substantially. In this case, W1-W2=MS serves as a maintenance tooth space.
[0102] The side face of the vacuum processing block 2 of the vacuum processor 100 of this invention has door structure of a closing motion type, as shown in drawing 8 . That is, the double door 214,216 opening outward is formed in the side and the tooth back of the vacuum processing block 2, respectively.
[0103] In order to maintain, there being a tooth space where (1) operator's can check a device, piping, etc. from order, and being [a tooth space which opens that there is a tooth space which takes out various kinds of piping devices, for example, the Maine chamber of a processing room, horizontally, and (2) (3) door] ** are required. Therefore, as a maintenance tooth space MS, it is good to be referred to as about 90-120cm.
[0104] According to the vacuum processor 100 of this invention, it is easy for an operator to approach the side and the tooth back of the vacuum processing block 2. Moreover, check repair of a load lock chamber 4, the unload lock chamber 5, the after-treatment room 7, the vacuum robot 10, and various kinds of piping devices can be performed by opening a door 214. Furthermore, check repair of the processing room 6, a vacuum pump, and various kinds of piping devices can be performed by opening a door 216.
[0105] Since the maintenance tooth space MS is between each vacuum processing block 2, it is convenient for an operator opening and closing the door 214 of the side and performing a maintenance in any way. Moreover, sufficient tooth space to open and close a door 216 and perform a maintenance also between the tooth backs of each vacuum processing block 2 is secured.
[0106] It is as having stated previously that the vacuum processor 100 of this invention is carrying out the flat-surface configuration of L typeface. On the other hand, generally the conventional vacuum processor 800 combines a vacuum processing block and a cassette block, as shown in drawing 9 , and the whole is constituted in the shape of a rectangle. A rectangular configuration is selected from the configuration and the mutual relation of operation of various elements which are arranged in a vacuum processor. It is the gap between vacuum processing blocks which sets the adjoining gap between cassette blocks to G1 with conventional equipment, and adjoins G2 When it carries out, generally it is G1 >=G2.
[0107] Although the above configurations were sufficient as the conventional vacuum processor 800 since the diameter d of the sample 3 to deal with was 8 inches or less, with the equipment which deals with the sample of a diameter [as / whose diameter d is 12 inches] of macrostomia, the dimension of a cassette 12 becomes large and the width of face W1 of the cassette block which contains two or more cassettes 12 becomes large. Since it combines with this W1 and the width of face (W2**W1) of a vacuum processing block is determined, the vacuum processor 800 whole will need a big tooth space. moreover — if the width of face W1 and W2 of a cassette block or a vacuum processing block becomes large — a door 214,216 — not enlarging — it does not obtain, but also in order to secure the tooth space which opens and closes a door 214,216, the big maintenance tooth space MS is needed. If a 12 inches sample is dealt with with conventional equipment as an example, it is set to W1=W2=150cm and G1=G2=90cm, and becomes a maintenance tooth space between the vacuum processors 100 with which MS=90cm adjoins.

This serves as increase of the effective occupancy area of the vacuum processor 800 in each bay area, and is not desirable.

[0108] An example of the interrelation of the various elements in a vacuum processor in this invention is explained in drawing 10 . As shown in drawing, it shifts to one of the right and left of Line LL which connects the mid-position of a load lock chamber 4 and the unload lock chamber 5, and the core of the processing room 6, i.e., the side edge side of the vacuum processing section, and the center line of rotation O1 of the vacuum robot's 10 arm is arranged. Moreover, the after-treatment room 7 is arranged in the opposite side of Segment LL. Therefore, the angle of traverse of the vacuum robot's 10 arm is narrow, and the flat-surface configuration of the whole vacuum processor 100 can be made into L typeface by considering as such a configuration by which the vacuum robot 10 is stationed near the side edge of the vacuum processing section. According to such a configuration, the angle of traverse of the vacuum robot's 10 arm serves as the abbreviation half of a periphery round. By making less than into an abbreviation semicircle the angle of traverse of the arm of the vacuum robot 10 which conveys a wafer, it is the circular motion within the abbreviation one half of a round, and the sample 3 of one sheet can be conveyed, respectively in a load lock chamber 4, the unload lock chamber 5, the processing room 6, and the after-treatment room 7. Thus, it is possible to write the angle of traverse of the vacuum robot's 10 arm less than in an abbreviation semicircle, and to narrow width of face W2 of the vacuum processing block 2.

[0109] thus, the vacuum processor 100 of this invention secure said maintenance tooth space by devise the configuration and the mutual relation of the various elements arrange in a vacuum processor, and make small width of face W2 of the vacuum processing block 2 as much as possible, make the width of face W1 of the cassette block 1 correspond to diameter-ization of macrostomia of a sample, and the effective occupancy area of the vacuum processor 100 in each bay area become large.

[0110] Since sufficient maintenance tooth space MS is between each vacuum processing block 2, it is convenient for an operator opening and closing the door 214 of the side and performing a maintenance in any way. Moreover, sufficient tooth space to open and close a door 216 and perform a maintenance also between the tooth backs of each vacuum processing block 2 is secured.

[0111] In the vacuum processor 100 of this invention, the physical relationship of the vacuum processing block 2 and the cassette block 1 can be changed along with the longitudinal direction of a cassette block. For example, when it puts in another way so that the center line of the longitudinal direction of the vacuum processing block 2 may cross in the center of a longitudinal direction of the cassette block 1 as shown in drawing 11 and drawing 12 , it is good also considering the whole flat-surface configuration as a T typeface. Since the above-mentioned maintenance tooth space MS is secured between the adjoining vacuum processing blocks 2 even if it makes it T typeface, it is convenient for an operator opening and closing the door 214 of the side and performing a maintenance in any way.

[0112] in addition — as long as, as for the flat-surface configuration of the cassette block 1 of this invention, and the vacuum processing block 2, the relation of -W2=MS is secured substantially (W1+G1) — — a not necessarily strict rectangle — you may not be — respectively — substantial — a rectangle — it is sufficient, if it puts in another way and the abbreviation rectangle is carried out. Moreover, the component contained in the cassette block 1 and the vacuum processing block 2 and arrangement relation are good also as a different thing from the already described example. For example, in the example shown in drawing 13 , the atmospheric-air robot 9 of the cassette block 1 is located between the load lock chamber 4 of a vacuum processing block, and the unload lock chamber 5. In this case, the flat-surface configuration of the cassette block 1 is a convex form strictly, and the flat-surface configuration of the vacuum processing block 2 is a concave strictly, and is T form where two abbreviation rectangles were together put as the vacuum processor 100 whole. Even if the atmospheric-air robot 9 does not move in a rail top by locating the atmospheric-air robot 9 of the cassette block 1 between a load lock chamber 4 and the unload lock chamber 5, and arranging a cassette 12 movable on a rail 94, the locus of a slide arm 91 can consist of this example so that it may become the locus which includes the unload side load lock chamber 5 in cassette 12 list at loading side load-lock-chamber 4 list. Also in this example, the above-mentioned maintenance tooth space MS is secured between the adjoining vacuum processing blocks 2.

[0113] Drawing 14 shows other examples of the vacuum processor 100 of this invention, and the evaluation of a base 130 and a sample and the checking console box 132 other than the atmospheric-air

robot 9 and the cassette 12 for samples are in the cassette block 1 every cassette.
[0114] Drawing 15 is the vacuum processor of the T character mold which shows other examples of the vacuum processor 100 of this invention, and equipped the cassette block 1 with the atmospheric-air robot 9 and sample orientation doubling [11].
[0115] Drawing 16 is the top view of other examples of the bay area 200 of this invention, opposite arrangement is carried out, the vacuum processors 100A and 100B of L typeface of a pair serve as a lot, and a console box 132 is between each class. In this example, although there is no above mentioned spacing G1, when width of face of a console box 132 is made into W3, (W1+W3)-W2=MS serves as a maintenance tooth space. In order that there may be no spacing G1, in order to maintain the vacuum processing block 2, an operator needs to enter through the maintenance path 210 to [from behind each bay area 200] field 201B with the vacuum processing block 2. As long as there is the need of shortening the time amount of this access, spacing G1 may be formed between a console box 132 and the next cassette block 1. At this time, (W1+W3+G1)-W2=MS serves as a maintenance tooth space.
[0116] Next, drawing 17 is the top view of the bay area incorporating the vacuum processor which becomes other examples of this invention. In the vacuum processor 100 of this example, cassette base 16A of two or more cassette blocks 1 is considered as the continuous one-configuration, and two or more atmospheric-air robots 9 run the common rail 95 top on it. The inside AGV of a bay intervenes between a bay stocker and the atmospheric-air robot 9, and delivers and receives the sample between each vacuum processing block 2. In this case, functionally, the cassette block 1 corresponds every vacuum processing block 2, and can be considered that many abbreviation rectangles corresponding to each vacuum processing block 2 are connected, respectively.
[0117] Drawing 18 is the top view of the example of a configuration of the production line of this invention. A flat-surface configuration is L typeface or T typeface, and even if spacing of each vacuum processor 100 is narrow, between each vacuum processing block 2, as for the vacuum processor 100 of this invention, sufficient maintenance tooth space MS is secured, so that clearly from drawing 18 .
[0118] On the other hand, in the vacuum processor 800 of the shape of a conventional rectangle shown for the comparison, if it is going to secure maintenance tooth space MS sufficient between each vacuum processing block, spacing of each vacuum processor 800 must be enlarged. Consequently, in Rhine of the same die length, the vacuum processor 100 of this invention can arrange only five sets with the vacuum processor 800 of the shape of a conventional rectangle like an example to the thing in which seven-set arrangement is possible. Two sets of these number differences become a big difference, when becoming a large number, securing the installation number of equipment in the clean room of a predetermined tooth space and saving a footprint, if it thinks with the whole semi-conductor production line. Moreover, when it considers conveying a sample from a bay area with AGV to the bay area of degree process and the vacuum processor of this invention is adopted, with conventional equipment, only processing for five sets can be performed to processing for seven vacuum processors being possible in Rhine of one side of one bay area. Two sets of these number differences influence greatly the improvement in a throughput of a semi-conductor production line.
[0119] In addition, also when the rectangle-like vacuum processor 800 needs to be used for a part depending on the contents of vacuum processing, it thinks. Even in such a case, the rectangle-like vacuum processor 800 is adjoined and the moderate maintenance tooth space MS can be secured between each vacuum processing block by arranging the vacuum processor 100 of L typeface of this invention, or T typeface.
[0120] Drawing 19 is other examples of the block diagram of the whole semi-conductor production line which adopted a part of vacuum processor of this invention. This equipment is equipped with Rhine AGV 204, and transfer of each bay areas 200A-200N and the sample between Rhine AGV204 is the Rhine automation method held by an operator intervening. There is the same effectiveness as the example of drawing 18 .
[0121] Drawing 20 is other examples of the block diagram of the whole semi-conductor production line which adopted a part of vacuum processor of this invention. This equipment is equipped with a bay AGV 202 and Rhine AGV 204, and transfer of the inside of each bay area and each bay areas 200A-200N, and the sample between Rhine AGV204 is a full automatic-ized method held without an operator's intervening. The moderate maintenance tooth space MS is securable between each vacuum processing block by arranging the vacuum processor 100 of vacuum processor 100 comrades of L typeface of this invention,

or T typeface, L typeface, or T typeface, and the rectangle-like vacuum processor 800 adjacently also in this case.

[0122] Moreover, although a cassette and an atmospheric-air carrier robot are stationed at an atmospheric-air ambient atmosphere and the atmospheric-air carrier robot explains in the above example as what operates in an atmospheric-air ambient atmosphere, even if a cassette 12 is arranged at a vacuum ambient atmosphere and it makes a carrier robot 10 operate only in a vacuum ambient atmosphere as it replaces with this, for example, is shown in drawing 21 or drawing 22 , it does not interfere. The example of drawing 21 shows the case where the number of cassettes 12 is two, and drawing 22 shows the case where the number of cassettes 12 is three. In any case, as the whole vacuum processor, it is the configuration of T mold.

[0123] In drawing 21 and drawing 22 , the receipt to the location of the radical in the ejection of the sample in a cassette 12, conveyance to the vacuum processing field of this sample paid picking, conveyance of the sample from a vacuum processing field, and the cassette of this sample is carried out by the vacuum carrier robot 10 in a vacuum ambient atmosphere, respectively. in this case, the funnel seen in principle as a vacuum processing system by the already described example - lock chamber and an unload lock chamber — it is not necessary to prepare — therefore, the computer of a high order — the number of elements for renewal of data decreases only at this rate serially.

[0124] In this case, the sample receipt condition of a cassette is carried out in a vacuum ambient atmosphere by the wafer check means. Moreover, in what has the orientation adjustment device of the sample before processing, adjustment of this orientation is carried out in a vacuum ambient atmosphere.

[0125] furthermore, the thing which prepares a middle cassette in a vacuum ambient atmosphere between a cassette and a vacuum processing field — setting — a cassette and a middle cassette — ** — it has the robot which conveys a sample in between, and the robot which conveys a sample between vacuum processing fields, respectively.

[0126] In the vacuum processing system corresponding to this, the number of elements for the renewal of serial data of the computer of a high order increases only at this rate for installation of a middle cassette.

[0127] Furthermore, although explained in the above example that each of receipt conditions of the sample in a cassette, conveyance conditions of a sample, and vacuum processing states was horizontal positions by processed side GA facing up of a sample, even if the postures of a sample are other postures, there is no special trouble.

[0128]

[Effect of the Invention] According to this invention, corresponding to diameter-ization of macrostomia of a sample, the rise of a manufacturing cost can be suppressed and the vacuum processor which was moreover excellent in maintenance nature can be offered. Moreover, the semi-conductor production line which secures the need installation number of a vacuum processor, and suppresses the rise of a manufacturing cost, and does not spoil maintenance nature, either can be offered, corresponding to diameter-ization of macrostomia of a sample by building the vacuum processor of this invention into a semi-conductor production line.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the appearance perspective view of the vacuum processor which becomes one example of this invention.
[Drawing 2] It is important section drawing of longitudinal section of the equipment of drawing 1 .
[Drawing 3] It is drawing showing the flat-surface configuration of the vacuum processor which met the II-II line of drawing 2 .
[Drawing 4] It is the IV-IV sectional view of the equipment of drawing 2 .
[Drawing 5] It is the top view showing an example of the bay area of the semi-conductor production line incorporating the vacuum processor of this invention.
[Drawing 6] It is drawing in the semi-conductor production line which becomes the example of this invention showing a part of flow of a sample 3.
[Drawing 7] It is drawing showing the relation of the magnitude of the vacuum processing block 2 and the cassette block 1.
[Drawing 8] It is the explanatory view of a maintenance of a vacuum processing block of the vacuum processor of this invention.
[Drawing 9] It is the top view showing the example of a configuration of the conventional vacuum processor.
[Drawing 10] It is drawing in this invention showing an example of the interrelation of the various elements in a vacuum processor.
[Drawing 11] It is drawing showing the flat-surface configuration of the vacuum processor which becomes other examples of this invention.
[Drawing 12] It is the perspective view of the vacuum processor of drawing 11 .
[Drawing 13] It is drawing showing the flat-surface configuration of the vacuum processor which becomes other examples of this invention.
[Drawing 14] It is drawing showing the flat-surface configuration of the vacuum processor which becomes other examples of this invention.
[Drawing 15] It is drawing showing the flat-surface configuration of the vacuum processor which becomes other examples of this invention.
[Drawing 16] It is the top view of other examples of the bay area of this invention.
[Drawing 17] It is the top view of other examples of the bay area of this invention.
[Drawing 18] It is the top view of the example of a configuration of the production line of this invention.
[Drawing 19] It is the top view of the example of a configuration of the production line of this invention.
[Drawing 20] It is the top view of the example of a configuration of the production line of this invention.
[Drawing 21] It is drawing showing the flat-surface configuration of the vacuum processor which becomes other examples of this invention.
[Drawing 22] It is drawing showing the flat-surface configuration of the vacuum processor which becomes other examples of this invention.
[Description of Notations]
1 [— A loading side load lock chamber, 5 / — An unload side load lock chamber, 6 / — A vacuum processing room, 7 / — An after vacuum processing room, 9 / — An atmospheric-air robot, 10 / — A vacuum robot, 100 / — Vacuum processor] — A cassette block, 2 — A vacuum processing block, 3 —

A buffer room, 4

[Translation done.]

* NOTICES *

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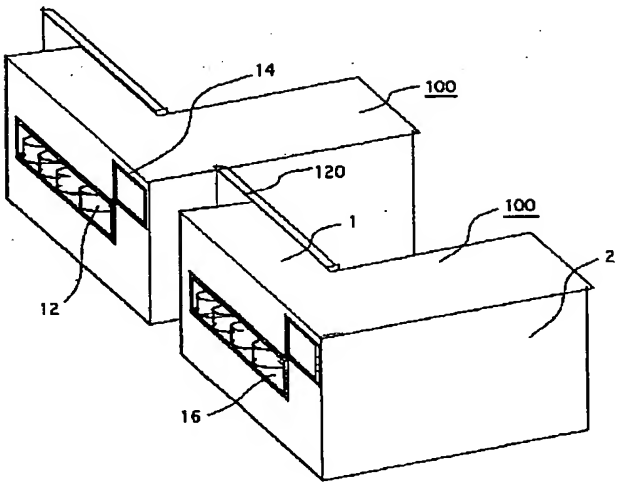
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

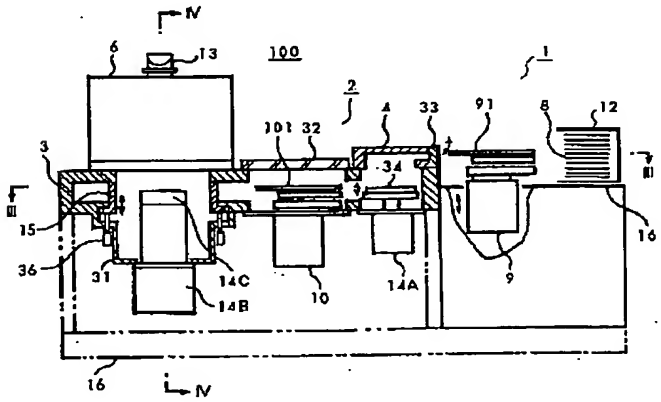
[Drawing 1]

図 1



[Drawing 2]

図 2



[Drawing 3]

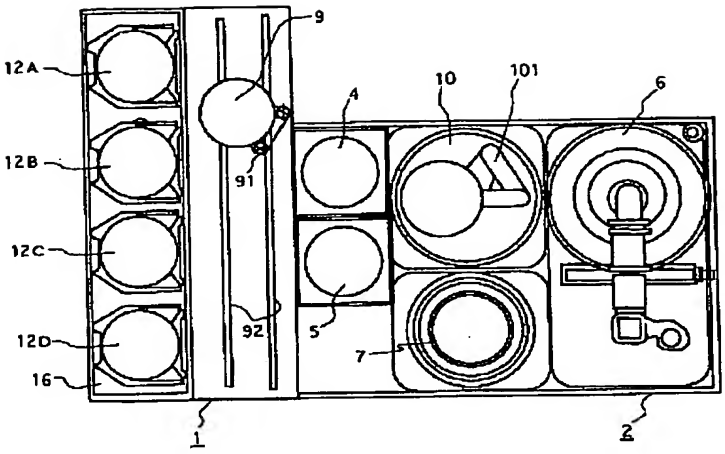
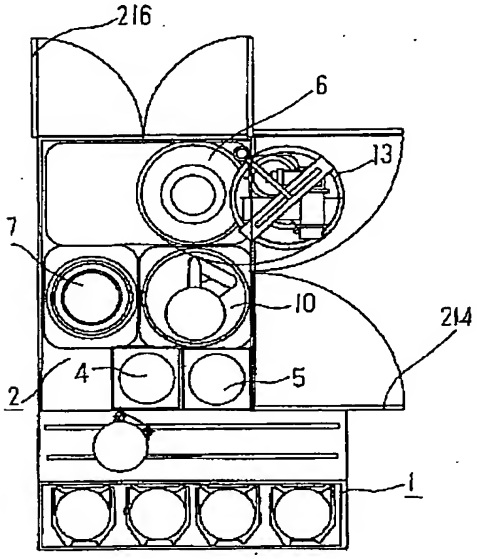


図 3

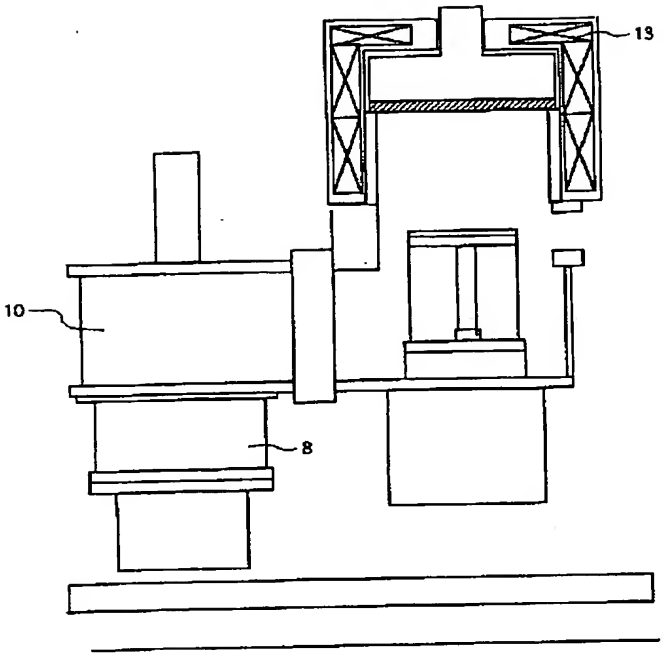
[Drawing 8]

図 8



[Drawing 4]

図 4



[Drawing 5]

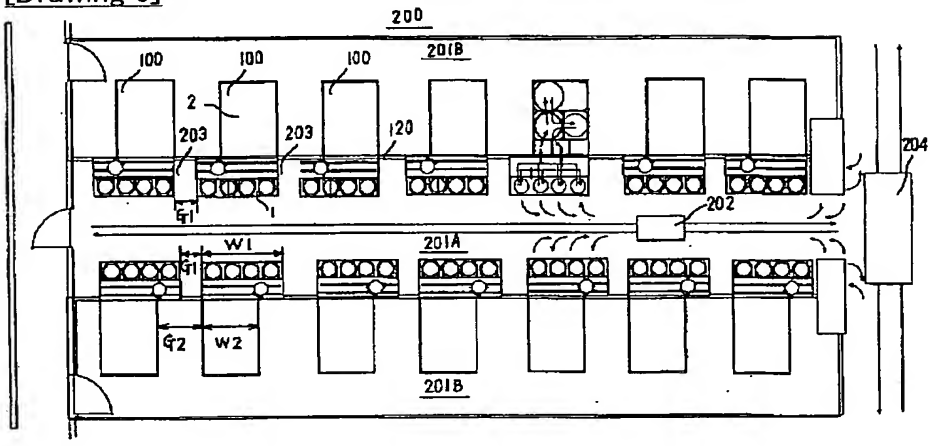
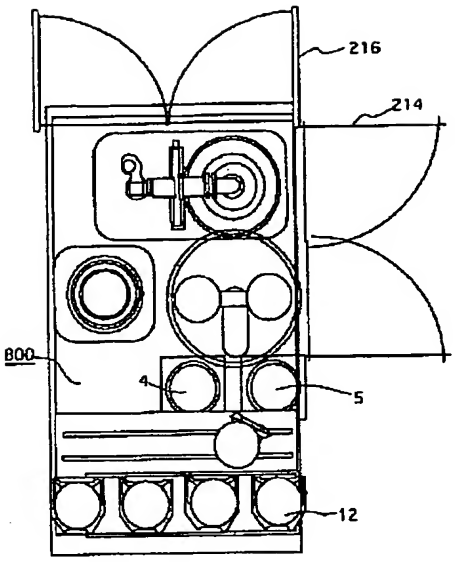


図 5

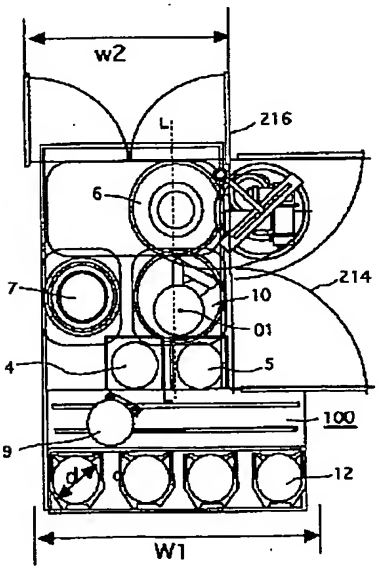
[Drawing 9]

図 9



[Drawing 10]

図 10



[Drawing 21]

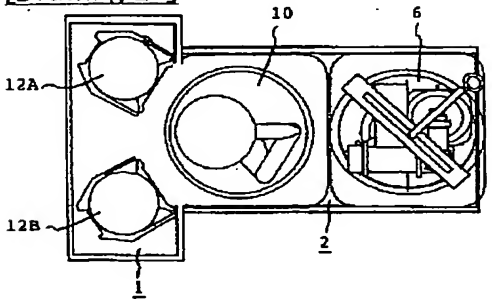


図 21

[Drawing 6]

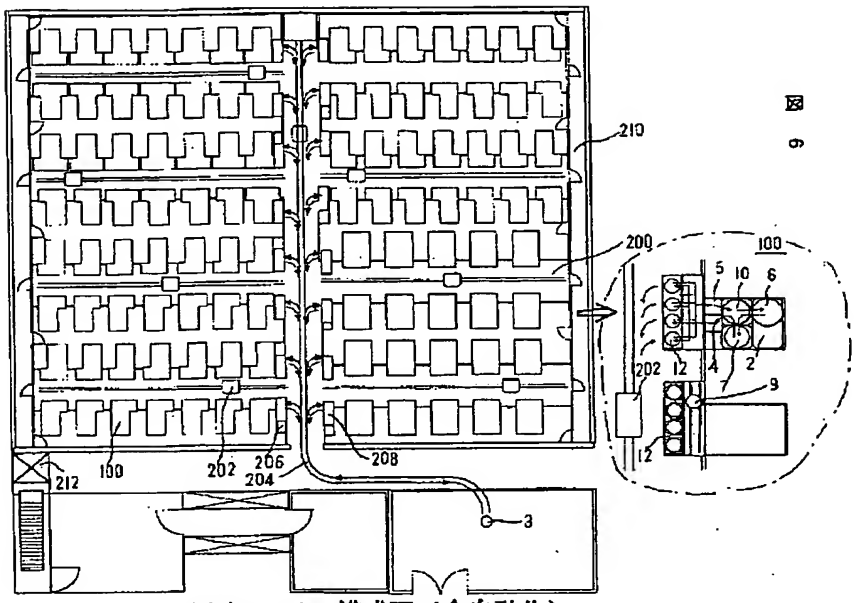


図 6

1(c) ライン構成図（全自動化）

[Drawing 7]

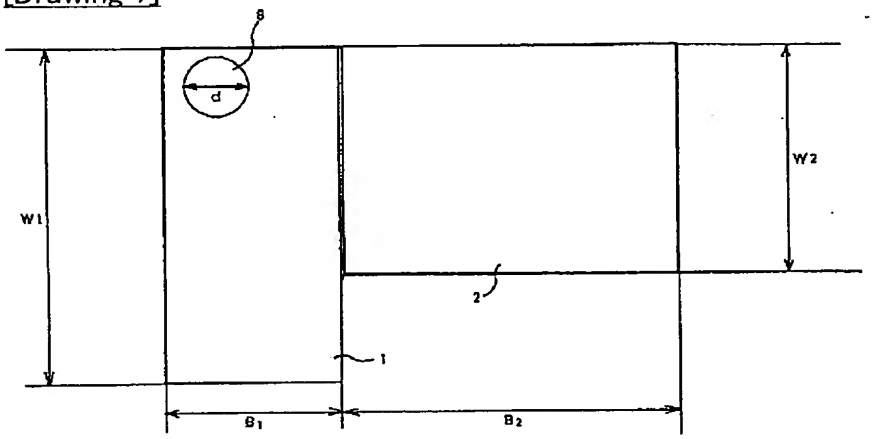


図 7

[Drawing 15]

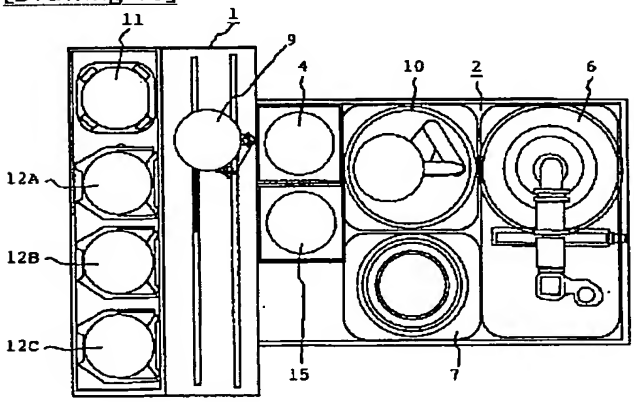
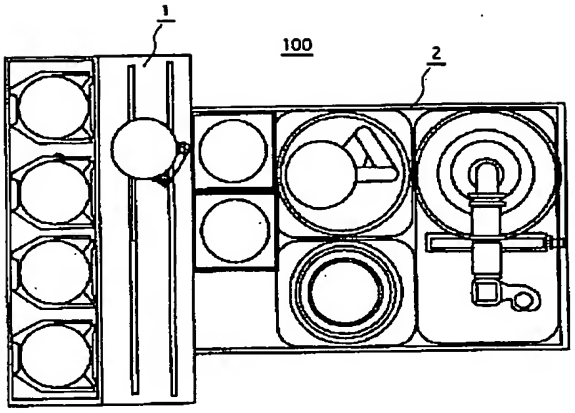


図 15

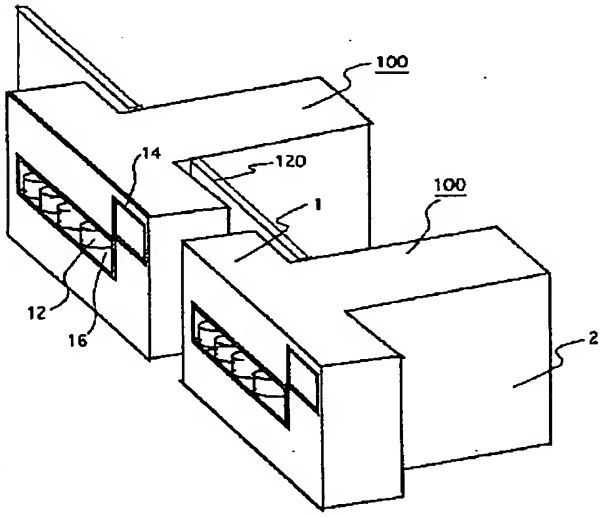
[Drawing 11]

図 11



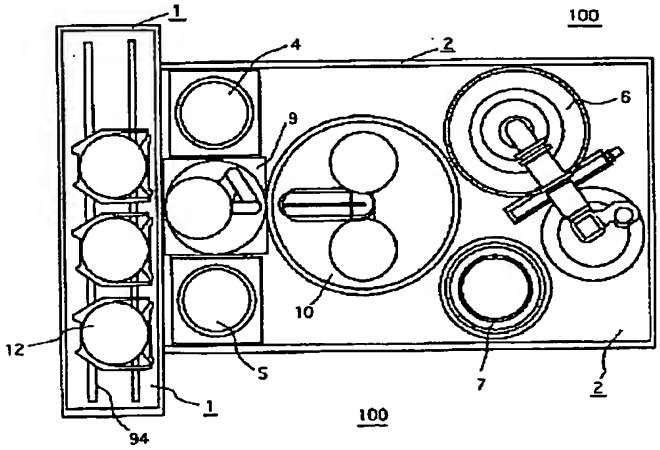
[Drawing 12]

図 12



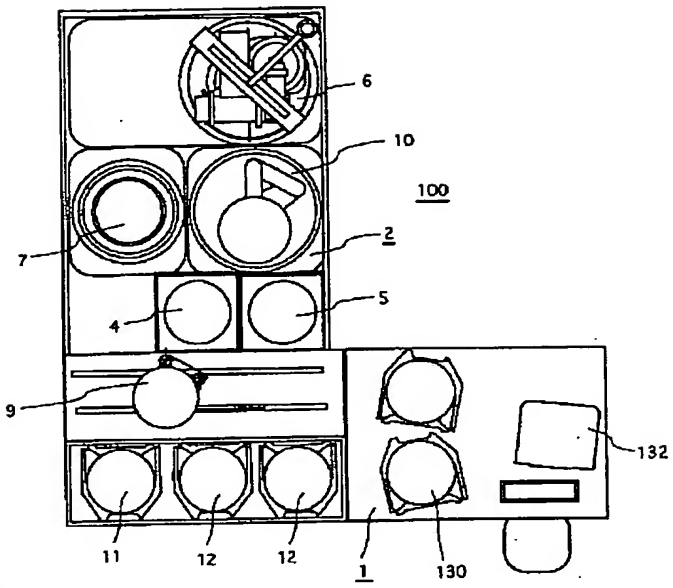
[Drawing 13]

図 1 3



[Drawing 14]

図 14



[Drawing 16]

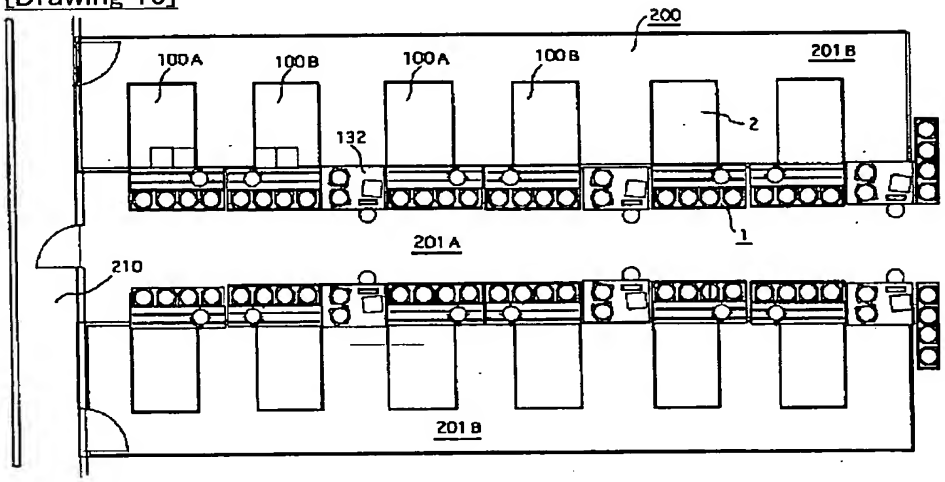


図 16

[Drawing 17]

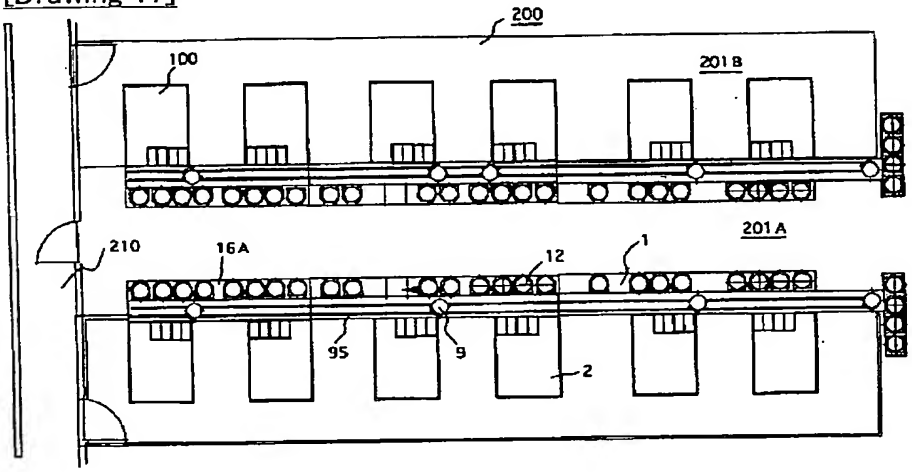


図 17

[Drawing 22]

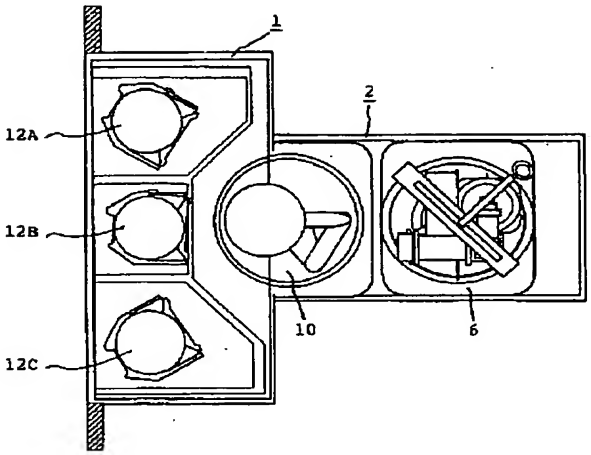
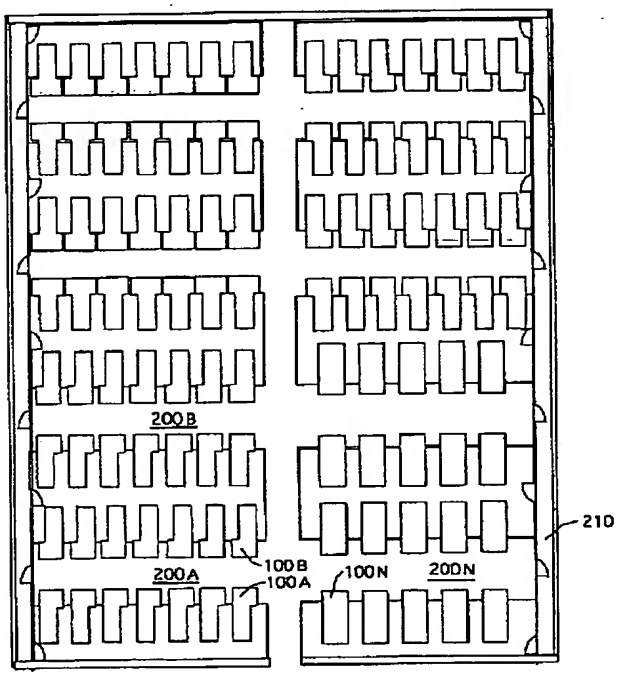


図 22

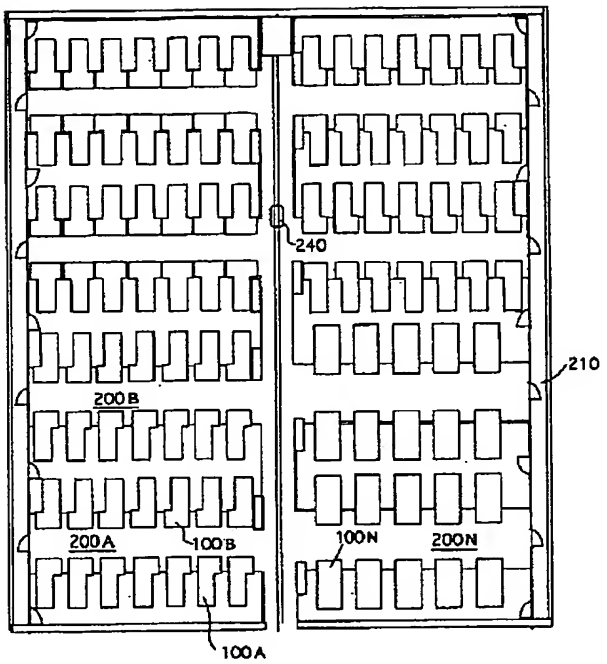
[Drawing 18]

図 18



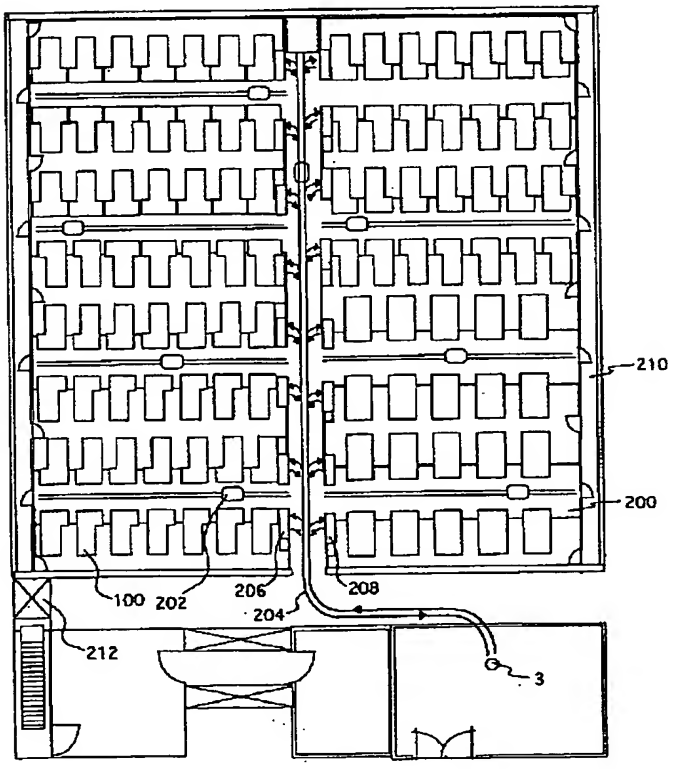
[Drawing 19]

図 19



[Drawing 20]

図 20



[Translation done.]

CORRECTION OR AMENDMENT

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[Section partition] The 2nd partition of the 7th section
[Publication date] June 20, Heisei 15 (2003. 6.20)

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[Application number] Application for patent 2002-204518 (P2002-204518)
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H01L 21/68
C23C 14/56
16/54

[FI]

H01L 21/68 A
C23C 14/56 G
16/54

[Procedure revision]
[Filing Date] March 11, Heisei 15 (2003. 3.11)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] The name of invention
[Method of Amendment] Modification
[Proposed Amendment]
[Title of the Invention] Vacuum processor
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] It is the vacuum processor which has one cassette block and two or more vacuum processing blocks,
Said one cassette block can lay two or more cassettes which contained the sample in the bottom of atmospheric air, and it has the first sample conveyance means which conveys said sample,
Each of said vacuum processing block has the second sample conveyance means which conveys said sample between a load lock chamber, the vacuum processing room which processes said sample under a vacuum, said vacuum processing room, and said load lock chamber,
Said two or more cassettes are arranged at the front section of said vacuum processor.

Said first sample conveyance means is a vacuum processor characterized by being a common conveyance means for conveying said sample between said two or more cassettes laid and said load lock chamber.

[Claim 2] It is the vacuum processor which has one cassette block and two or more vacuum processing blocks,

Said one cassette block can lay two or more cassettes which contained the sample in the bottom of atmospheric air, and it has the first sample conveyance means which conveys said sample,

Each of said vacuum processing block has the second sample conveyance means which conveys said sample between a load lock chamber, the vacuum processing room which processes said sample under a vacuum, said vacuum processing room, and said load lock chamber,

Said two or more cassettes are arranged at the front section of said vacuum processor,

Said first sample conveyance means is a vacuum processor characterized by carrying out horizontal migration in the direction where it is arranged between said two or more cassettes laid and said load lock chamber, and said two or more cassettes are put in order.

[Claim 3] It is the vacuum processor which has one cassette block and two or more vacuum processing blocks,

Said one cassette block can lay two or more cassettes which contained the sample in the bottom of atmospheric air, and it has the first sample conveyance means which conveys said sample,

Each of said vacuum processing block has a load lock chamber, the vacuum processing room which processes said sample under a vacuum, and the second sample conveyance means which conveys said sample under a vacuum,

Said two or more cassettes are arranged at the front section of said vacuum processor,

Said first sample conveyance means is a vacuum processor characterized by being a common conveyance means for conveying said sample between said two or more cassettes laid and said load lock chamber.

[Claim 4] It is the vacuum processor which has one cassette block and two or more vacuum processing blocks,

Said one cassette block can lay two or more cassettes which contained the sample in the bottom of atmospheric air, and it has the first sample conveyance means which conveys said sample,

Each of said vacuum processing block has a load lock chamber, the vacuum processing room which processes said sample under a vacuum, and the second sample conveyance means which conveys said sample under a vacuum,

Said two or more cassettes are arranged at the front section of said vacuum processor,

Said first sample conveyance means is a vacuum processor characterized by carrying out horizontal migration in the direction where it is arranged between said two or more cassettes laid and said load lock chamber, and said two or more cassettes are put in order.

[Claim 5] It is the vacuum processor which has one cassette block and two or more vacuum processing blocks,

Said one cassette block has the cassette base which lays two or more cassettes which contained the sample in the bottom of atmospheric air, and the first sample conveyance means which conveys said sample,

Each of said vacuum processing block has the second sample conveyance means which conveys said sample between a load lock chamber, the vacuum processing room which processes said sample under a vacuum, said vacuum processing room, and said load lock chamber,

Said cassette base is arranged at the front section of said vacuum processor,

Said first sample conveyance means is a vacuum processor characterized by being a common conveyance means for conveying said sample between said two or more cassettes laid in said cassette base, and said load lock chamber.

[Claim 6] It is the vacuum processor which has one cassette block and two or more vacuum processing blocks,

Said one cassette block has the cassette base which lays two or more cassettes which contained the sample in the bottom of atmospheric air, and the first sample conveyance means which conveys said sample,

Each of said vacuum processing block has the second sample conveyance means which conveys said

sample between a load lock chamber, the vacuum processing room which processes said sample under a vacuum, said vacuum processing room, and said load lock chamber,
Said cassette base is arranged at the front section of said vacuum processor,
Said first sample conveyance means is a vacuum processor characterized by carrying out horizontal migration in the direction where it is arranged between said two or more cassettes laid in said cassette base, and said load lock chamber, and said two or more cassettes are put in order.
[Claim 7] It is the vacuum processor characterized by dividing said both load locks chamber into a loading side load lock chamber and an unload side load lock chamber in a vacuum processor according to claim 1 to 6, and being constituted.
[Claim 8] One cassette block which has the first sample conveyance means which can lay two or more cassettes which contained the sample in the bottom of atmospheric air, and conveys said sample,
The first vacuum processing block which has the second sample conveyance means which conveys said sample between the first load lock chamber, the first vacuum processing room which processes said sample under a vacuum, and said first load lock chamber and said first vacuum processing room,
It is the vacuum processor which has the second vacuum processing block which has the third sample conveyance means which conveys said sample between the second load lock chamber, the second vacuum processing room which processes said sample under a vacuum, and said second load lock chamber and said second vacuum processing room,
Said two or more cassettes are arranged at the front section of said vacuum processor,
Said first sample conveyance means is a vacuum processor characterized by being a common conveyance means for conveying said sample between said two or more cassettes laid, said first load lock chamber, and said second load lock chamber.
[Claim 9] One cassette block which has the first sample conveyance means which can lay two or more cassettes which contained the sample in the bottom of atmospheric air, and conveys said sample,
The first vacuum processing block which has the second sample conveyance means which conveys said sample between the first load lock chamber, the first vacuum processing room which processes said sample under a vacuum, and said first load lock chamber and said first vacuum processing room,
It is the vacuum processor which has the second vacuum processing block which has the third sample conveyance means which conveys said sample between the second load lock chamber, the second vacuum processing room which processes said sample under a vacuum, and said second load lock chamber and said second vacuum processing room,
Said two or more cassettes are arranged at the front section of said vacuum processor,
Said first sample conveyance means is a vacuum processor characterized by carrying out horizontal migration in the direction where it is arranged between said two or more cassettes laid, said first load lock chamber, and said second load lock chamber, and said two or more cassettes are put in order.
[Claim 10] One cassette block which has the cassette base which lays two or more cassettes which contained the sample in the bottom of atmospheric air, and the first sample conveyance means which conveys said sample,
The first vacuum processing block which has the second sample conveyance means which conveys said sample between the first load lock chamber, the first vacuum processing room which processes said sample under a vacuum, and said first load lock chamber and said first vacuum processing room,
It is the vacuum processor which has the second vacuum processing block which has the third sample conveyance means which conveys said sample between the second load lock chamber, the second vacuum processing room which processes said sample under a vacuum, and said second load lock chamber and said second vacuum processing room,
Said cassette base is arranged at the front section of said vacuum processor,
Said first sample conveyance means is a vacuum processor characterized by being a common conveyance means for conveying said sample between said two or more cassettes laid in said cassette base, said first load lock chamber, and said second load lock chamber.
[Claim 11] One cassette block which has the cassette base which lays two or more cassettes which contained the sample in the bottom of atmospheric air, and the first sample conveyance means which conveys said sample,
The first vacuum processing block which has the second sample conveyance means which conveys said sample between the first load lock chamber, the first vacuum processing room which processes said

sample under a vacuum, and said first load lock chamber and said first vacuum processing room.
It is the vacuum processor which has the second vacuum processing block which has the third sample conveyance means which conveys said sample between the second load lock chamber, the second vacuum processing room which processes said sample under a vacuum, and said second load lock chamber and said second vacuum processing room.
Said cassette base is arranged at the front section of said vacuum processor.
Said first sample conveyance means is a vacuum processor characterized by carrying out horizontal migration in the direction where it is arranged between said two or more cassettes laid in said cassette base, said first load lock chamber, and said second load lock chamber, and said two or more cassettes are put in order.
[Claim 12] It is the vacuum processor characterized by dividing said the first load lock chamber and said second load lock chamber both into a loading side load lock chamber and an unload side load lock chamber in a vacuum processor according to claim 8 to 11, and being constituted.
[Claim 13] The vacuum processor characterized by arranging the first cassette before said first vacuum processing block, arranging the second cassette before said second vacuum processing block in a vacuum processor according to claim 8 to 11, and arranging the third cassette between said first vacuum processing block and said second vacuum processing block.
[Claim 14] The vacuum processor characterized by a maintenance tooth space being between said first vacuum processing block and said second vacuum processing block in a vacuum processor according to claim 8 to 11.
[Claim 15] It is the vacuum processor characterized by one atmospheric-air robot running a common rail top in a vacuum processor according to claim 1 to 14, as for said first sample conveyance means.

[Translation done.]